

TOTAL EXCISION OF THE SCAPULA, WITH PRESERVATION OF THE UPPER EXTREMITY.

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EXCISION of the entire scapula alone is a comparatively rare operation, and this case is, so far as I have been able to ascertain, the first one performed at the Charity Hospital of New Orleans since Logan's successful case in 1871. The degree of usefulness of the extremity is so great, after such an extensive removal of the bone, that I deem the case worthy of record.

Total excision of the scapula, with preservation of the arm, is an operation which has been performed only in the past half century. In conditions other than malignant disease, the permanent results of the operation have been most gratifying. With the exception of slight impairment of abduction, all the motions of the arm are retained, and its usefulness but little impaired by the operation.

To Langenbeck we are indebted for the first operation of this kind. This was done in 1855, on a boy of twelve years, who lived for three and a half months after the operation, and finally died of a recurrence of the malignant disease. Like all scientific innovations, Langenbeck's achievement was but the outcome of a gradual evolution. First proposed by Liston in 1819, it was reserved for the following surgeons to really contribute to the subject in a durable form. In 1824, Jansen, of Lyons, removed the entire body of the scapula; in 1830, Skey, of London, removed all but the glenoid process; in 1849, Sentin removed all but part of the acromion; in 1850, Lan-

genbeck removed all but the coracoid process; and in 1853 Bruns all but the acromion and coracoid processes. The operation was further elaborated by Ferguson and Syme in England and Scotland, by Petreguin and Berger in France, by Reed in Germany, and Gross and Stephen Rogers in America.

CASE.—A negro bootblack, born and reared in New Orleans and twenty years of age, was admitted in the Charity Hospital on July 16, 1900, with the following history: At the age of five he contracted smallpox, which is evidenced by his well-pitted face, and about four years ago he accidentally shot himself in the left eye, losing that organ. Otherwise he has enjoyed good health until a year ago, when he noticed a slight stiffness in the movements of the right arm, accompanied by a moderate swelling at the corresponding shoulder. It caused him no pain, only a slight discomfort on certain motions of the shoulder-joint, or when he lay upon the affected side. These symptoms remained about the same until two weeks before admission, when he experienced pain and more difficulty in using the arm, and was not able to work at his trade with his usual facility.

Examination on admission showed a suppurating sinus on the back at the junction of the spine and spinal border of the scapula. The pus that exuded was thick and very foul. Thoracic examination proved negative. He had lost flesh and strength since the appearance of the ulcer and looked somewhat anæmic. The skin was normal in appearance and freely movable over the scapula.

On July 24, under chloroform anæsthesia, a free incision was made along the spinal border of the scapula for the purpose of ascertaining the extent of the disease. On examining the parts thus laid bare, it became at once evident that conjoined caries and necrosis were so extensive as to require the excision of the whole bone. Exploration with the index-finger showed that the long-continued suppuration had caused some separation of the periosteum; indeed, quite a part of the outer surface of the bone was stripped of its periosteal covering.

The vertical incision was now promptly extended to about an inch beyond the inferior angle of the scapula, so as to give ample room to get beneath and around that part of the bone and

lift it up. This was readily effected after the soft parts had been divided and the flaps over the dorsum dissected up. With the inferior angle held up, the subscapularis muscle was stripped from the under surface of the scapula and temporarily left in the wound. The axillary border of the scapula was now freed from its muscular attachments, and a second incision at right angles to the vertical one was made over the spine, ending at the acromion process. The deltoid and trapezius were detached from the spinal attachment, and the upper margin of the bone was thus cleared of the muscles. This freed the diseased scapula from the chest, so that it could be lifted up from the ribs and tilted outward and forward, exposing the shoulder-joint. This was now opened from above and behind, at the same time keeping close to the glenoidal attachment, so as to retain as much of the capsule as possible for the new joint.

At this stage of the operation the coracoid process was dissected away from its muscular attachments by a division of the tendons of the pectoralis minor, biceps and coracobrachialis, and also of the coracoclavicular ligaments. By keeping the knife close to the bone, no difficulty was experienced in freeing it. The amount of hæmorrhage was unexpectedly small, no artery of size being tied; but three or four ligatures were used.

This vast area thus exposed was thoroughly irrigated with an antiseptic solution and dried. The capsular ligament was then sutured to the soft parts right under the acromial process of the clavicle, and the muscles sutured in such a manner as to secure them in about their normal relation. The wound was united with silkworm-gut sutures, and a small gauze drain was left in the angles. The arm was carried to the side and crowded well up to the acromial end of the clavicle. The forearm was flexed and supported in a sling. The operation was attended by remarkably little shock and by little loss of blood.

In the later course of the case there was hardly any reactionary fever. The patient slept, ate, and drank tolerably well, and the wound united in a great degree by primary union, so far as the skin was concerned, though a somewhat prolonged suppurative process took place beneath, the discharges finding vent through two openings,—the one provided at the operation and a counterpuncture made afterwards higher up, where the pus seemed to bag somewhat, and thus required a freer outlet.

The wound had completely cicatrized by about the middle of December; the health of the patient was fairly good to all appearances. At the time of his discharge, five months after the operation, he was much improved in health, and the general and local appearance were as the accompanying photographs represent. An examination of the patient at the time showed that he possessed all the voluntary movements of the arm. He could, besides these movements, elevate the arm from the side between twenty and thirty degrees. Subsequently, all the voluntary movements acquired still greater range. So useful had the extremity become, that shortly after his discharge he resumed his work as a bootblack. When dressed, the resulting deformity was scarcely noticeable.

Consequences of the Operation from a Functional Stand-point.—An examination of the patient at the time of his discharge as to his motor and sensory functions was made. All these functions are perfectly performed with the exception of abduction, which is diminished by fully one-half. This is easily explained, as the deltoid muscle, the only abductor muscle of the arm, had lost half of its origin, and the head of the humerus no longer had a firm *point-d'appui*.

External rotation of the upper extremity is performed with ease, showing that the supra- and infraspinatus and teres minor muscles are not altered. The adductor muscles, the latissimus dorsi, teres major, and pectoralis major not being in any way disturbed, adduction is readily performed. One would suppose that flexion and extension of the forearm would be impaired, owing to the loss of insertion of the two heads of the biceps and of the long head of the triceps; but this was not the case. The respiratory muscles must also be considered,—the serratus magnus, the pectoralis major and minor. The pectoralis major is left intact; it has no connection with the scapula, but is an auxiliary suspensor of the upper extremity. When its insertion in the humerus is the fixed point, it acts as an inspiratory muscle. After disarticulation of the scapula, this action is impaired. The pectoralis minor is also an inspiratory muscle when its fixed point is at the scapula; deprived of that point its inspiratory action is lost. The serratus magnus is likewise an inspiratory muscle, especially its upper portion, when its fixed point is in the scapula. For this function, it must receive the aid of the rhomboideus



FIG. 1.—Result after total excision of the scapula, posterior view.



FIG. 2.—Result after total excision of the scapula, anterior view.

major and minor. These muscles being incised, their action as respiratory muscles is impaired. Hence, after a total excision of the scapula, the pectoralis major and minor and the serratus magnus muscles are no longer extraordinary inspiratory muscles.

I cannot help thinking that this impairment of the respiratory movements of one-half of the chest can but have an unfavorable influence over the lungs, cause it to become atrophied by reason of its diminished physiological activity, and expose it to tuberculosis infection.

All the muscles mentioned above responded to electrical stimulation. No delay in the perception of sensations was experienced. Common sensation (touch) and sensation to pain were just as acute as on the unaffected side. There has been no modification in thermic sensibility. There seems to be little retraction of the muscles in aponeurotic spaces of the arm, as the triceps and biceps. There has been no muscular atrophy, no changes in the sudoral secretion, no hypertrophy of the nails, in fact, no trophic change of any kind.

The strength of the upper extremity was tested. He can lift readily any moderately heavy article. He can place his hand on either ear or shoulder, on the back of the neck, and can pass his hand over the whole of his forehead and face and behind his back. He can bring his hand to sweep over the whole face and cheek. The degree of usefulness remaining to the limb exceeds anything that I could expect. There is a considerable amount of hard, fibrous material about the new joint, and, as a result of this rigid condition of the parts, the upper extremity of the humerus, itself involved in the mass, is held much more firmly in position than would otherwise be the case, assuring the stability of the humerus.

An attempt at a radiograph was made, but was not sufficiently satisfactory to be reproduced here. It was instructive in so much as it showed the relations of the head of the humerus with the clavicle.

Indications for Operation.—Conditions requiring excision of the scapula are three in number. The first is traumatism, such as gunshot wounds, and here military surgery supplies a great number of cases; the second is from acute or chronic inflammatory lesions (osteomyelitis, necrosis, tubercu-

lous ostitis) ; and, thirdly, from tumors, benign or malignant, which require total or partial resection of the bone. In some cases of excision of the scapula, the operation is limited to the removal of the scapula only ; in other cases the operation is complicated by the excision of neighboring bones or of the entire upper extremity.

Excision of the scapula and the upper extremity has been advised in the treatment of tumors of the scapula or of the superior extremity of the humerus. In several instances resection of the upper extremity of the humerus, together with the scapula, has been practised, whether the head of the bone was diseased or not.

In some cases the excision of the scapula was a secondary operation, necessitated by a recurrence of the cicatrix from a former operation of the disarticulation of the upper extremity for a neoplasm.

Lastly, partial or complete resection of the scapula was done in cases where the lesion was localized or had invaded the whole bone, or when the nature of the affection aroused or not the idea of a possible recurrence.

In the report of this case, it is my purpose to limit myself to the consideration of tuberculous affections of the scapula. This affection is rare, and when observed in its incipency is localized in a part of the bone. More frequently, however, hospital patients, before seeking relief, wait until the affection has invaded the greater part or the whole of the bone.

Berger, in his work on interscapulo-thoracic amputation, states that in any tumor of the scapula of a malignant nature (sarcomata, carcinomata, etc.) the operation is justifiable. According to the same author, the question narrows itself to the choice between total excision of the scapula and interscapulo-thoracic amputation. The latter operation, though the more serious one, is less frequently followed by recurrence. Still, he considers resection the operation by election, and recommends interscapulo-thoracic operation only in cases when the first operation cannot be done.

As to partial resections, statistics seem to show that they

were performed by two different ways. In one the operation was limited solely to the removal of the diseased portion of the scapula; in the other operation, not only the diseased portion was removed, but the whole scapula was excised, with the exception of the acromial and coracoid processes and the glenoid fossa, in fact, the axillary angle of the scapula. The latter operation was usually adopted in the hope of limiting the disease and preventing any recurrence; also in the hope of preserving for the patient muscular functions.

Stephen Rogers thinks that the danger from total resection is less than from partial resection and resections leaving the anterior angle.

The literature upon the subject at the present time, disseminated over a vast field of periodical publications, has been gathered by Buchanan, in the *Philadelphia Medical Journal*, 1900, Vol. vi, into a form to make it useful for the guidance of the surgeon. In a most elaborate and painstaking article the author has in a concise form brought the subject up to the latest theories, and compiled a most complete set of statistical tables, which embody the history of operations involving the loss of a portion or the entire scapula, in their chronological order. This article is the more instructive as our standard works on surgery are silent on the subject.

We do not learn from the exhibit of these tables that the removal of the entire scapula is a more serious operation than the removal of the greater part of it, for it appears that of the ninety-four cases in which more or less of the scapula was removed, eleven died of causes more or less directly connected with the operation. Now, if we look at the cases in which the entire scapula was removed preserving the arm, and in a few of them the clavicle was involved also, we see that death as a result, even remotely, of the operation, occurred in but few of them. This result is in support of Stephen Rogers's opinion that the removal of a large part of the scapula for disease is a more dangerous operation than the removal of the whole bone.

While, unfortunately, no new light upon the pathology or the progress of operations performed for cancerous disease

is afforded by these tables, it stimulates the brightest hopes for the operation of removing the scapula preserving the arm, where the destroying disease is caries or necrosis. In fourteen operations death followed in one only, or 7.1 per cent. Now, as regards the immediate danger of the operation, this does not appear to me to be great.

In estimating the probable constitutional depression which the removal of the scapula is likely to produce, surgeons appear to have been uninfluenced by the histories of many recorded cases of the accidents by which the arm, including the scapula, has been torn from the body by machinery. Rogers reports eleven such cases, all recovered.

It will be observed that cases of excision of the scapula have been uniformly attended by little loss of blood and by remarkably little shock. No ligatures were employed in most of them, because there was no hæmorrhage requiring them, and recovery has been uniform.

It will probably be noted that no allusion has been made to the subject of the comparative usefulness of the arm in case of the removal of all or the greater part of the scapula. So far, then, as experience goes, we have no reason to think that the utility of the arm is much, if any, increased by leaving a piece of the scapula, including the glenoid cavity.

Results.—In an analysis of about 200 cases, Buchanan concludes that if, by removal of less than the entire body of the scapula, the growth can be entirely extirpated, the operative mortality is least, while the probability of a permanent cure is greater than if the entire bone were removed. If, however, the removal of the diseased tissue requires excision of the entire body of the scapula or more, then the immediate mortality becomes greater, and the probability of permanent cure less than when the total extirpation of the bone is practised. In cases of tuberculosis, osteomyelitis, and necrosis, where the entire body of the bone requires removal, total excisions are no more dangerous than partial ones.

As a whole, the mortality from total extirpation for all cases, as taken from Buchanan's tables, was eleven from sev-

enty-two cases, or 15 per cent.; the cause of the death being especially from sepsis and hæmorrhage. In the group of partial extirpations we note seventeen deaths from ninety-four cases, or 18 per cent. In the second group of the partial extirpations, we find one death from twelve cases.

It must be remembered that the majority of these operations were performed in the pre-aseptic epoch, and with appliances which have been perfected in our days. For that reason the above figures have fortunately lost much of their importance.

It is certain that the results above mentioned are not sufficient to arrive at a definite appreciation. In cases of malignant disease, it would have been interesting to compare the percentage of recurrence in total excision, with or without the resection of the head of the humerus, and partial excision. We would thus have been able to decide which of the operations assured greater protection from recurrence. From a study of these statistics, we conclude that none of the operations practised offer absolute protection from recurrence; even total excision, the most radical of all, still furnishes too great a percentage of recurrence. Be this as it may, total excision, not being followed by a greater mortality than from any other of the operations, recommends itself in cases of malignant tumors, and, in my opinion, Langenbeck's advice to retain the coracoid process and glenoid fossa for better muscular movements should not be followed. One consideration only could cause the surgeon to hesitate in the selection of the operation of total excision, and that is the functional impairment following that operation. And from a study of the case here reported, we have shown that in cases of necrosis and caries, functional impairment need not be feared; and, on the other hand, in cases of malignant growths, where functional results are of secondary importance, total excision assures greater security from recurrence.

The legitimate surgical character of the operation is no longer a subject of doubt; and we are not now liable to the criticism which was so severely bestowed upon Syme in 1856,

for having practised an operation which, at best, must leave a worse than useless arm, as was alleged. On the contrary, it is nowadays practised, defended, and urged with enthusiasm by the highest surgical authority.

There is no anatomical or pathological reason why the scapula should not be removed for any disease of the bone for which sound surgery would make it expedient to remove any other bone in the frame; and in malignant disease of the bone it is safer and better surgery, as it is in similar disease in all bones, to remove the whole rather than a part. The prognosis as to the value of the arm in case of removal of all, or part, of the scapula may be almost positively, and to a high degree, favorable.